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5 **BUSINESS SYSTEMS MANAGEMENT: REALIZING END-TO-END**
 ENTERPRISE SYSTEMS MANAGEMENT SOLUTION

BACKGROUND OF THE INVENTION

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1. Technical Field:

 The present invention relates to a business method
for computer networks. More specifically, the present
invention relates to the integration of disparate
15 applications into a single functional application model
that is then managed from an IT perspective as a single
integrated system.

2. Description of Related Art:

20 Currently, companies have "business processes" such
as a Banking loan process, that are enabled by multiple
heterogeneous technology. Because the business process
itself may span multiple lines of business both
internally and externally (supply chain processes), very
25 often the enabling technology is of disparate types,
managed by disjoint groups with little systems management
integration between them. An example of this would be a
loan process that is enabled by technology ranging from
application, database, network, and server. In this
30 example, it is very likely that each application, and
associated enabling technology, would have a support
group. Each group has a very focused view on their

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component, but no one has the business process view which
is the aggregate of each of these "towers" as viewed by
the business. The systems management paradigm is not
aligned with how the business consumes the technology at
5 the business level, and therefore does not reflect the
true "health" of the business process as viewed by the
consumers of the business process.

Therefore, a method of integrating the disparate
applications into a single functional application model
10 that includes the interdependencies, relationships and
interfaces of each application would be desirable.

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SUMMARY OF THE INVENTION

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The present invention provides a method for
5 integrating the many heterogeneous IT components
(application, database, server, network) which enable a
business process into a single end-to-end management
platform. The method comprises decomposing a business
process (intra-enterprise, extra-enterprise (i.e.
10 multiple business entities) or both) into a set of
enabling applications and then documenting the technology
elements and support organizations which are necessary to
execute and manage those enabling applications. The
required monitors for the business process enabling
15 technology can be deployed which not only monitor the
discreet IT components but also the interfaces between
them that are imposed by the business process itself. An
important, and unique, feature of this method is the
ability to map technology problems to business problem
20 and the development of cross-platform contextual
(business process context) correlation rules. This
information is then used to develop an end-to-end
business process event management platform (can be used
for other systems management processes as well such as
25 Performance Management), which can be integrated into any
preexisting event management (systems management)
process. In one embodiment of the present invention, the
event management platform can be constructed between
several business entities.

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BRIEF DESCRIPTION OF THE DRAWINGS

5 The novel features believed characteristic of the
invention are set forth in the appended claims. The
invention itself, however, as well as a preferred mode of
use, further objectives and advantages thereof, will best
be understood by reference to the following detailed
description of an illustrative embodiment when read in
10 conjunction with the accompanying drawings, wherein:

Figure 1 depicts a pictorial representation of a
network of data processing systems in which the present
invention may be implemented;

15 **Figure 2** depicts a block diagram of a data processing
system that may be implemented as a server in accordance
with a preferred embodiment of the present invention;

Figure 3 depicts a block diagram illustrating a data
processing system in which the present invention may be
implemented; and

20 **Figure 4** depicts a flowchart illustrating a method
for developing an end-to-end Event Management application
in accordance with the present invention.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

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Businesses have numerous critical processes which are
5 enabled by multiple, disparate technologies. In today's
IT environment, there is often a support group for each
type of technology, each with its own "tower" management
platform. In addition, each group has its own management
10 tools typically focused on monitoring a specific subsystem
or element within the IT infrastructure, with little or no
capability to evaluate how that component actually impacts
the business process from an end-to-end perspective.
Because the management towers are often very disjoint,
complex problems are often very difficult to quickly
15 identify, often lead to multiple support personnel being
needlessly dispatched, and have no concept of business
impact. This is particularly evident in the current event
management and business process "view" tools which only
consider the "IT severity" of an event as opposed to
20 mapping a particular anomaly to a business impact. The
following example will help illustrate this concept.

One server must communicate to another server, via a
network route, in order to complete a particular business
transaction. If the network failed, or went down, from an
25 IT perspective the network event generated by this failure
might be "fatal" or completely down. At the network
support layer this IT component failure would trigger
immediate support attention. However, at the business
process layer, the network failure is only "fatal" or
30 fully down if there is a current request for these two
systems to communicate. If no one needs the business
process at the point of failure then the fact that a
network is down is important, but to the business, it is

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transparent. At the event level of the network failure there is no intelligence to determine whether or not the business process has actually been impacted and will always show "fatal" when it goes down. This means that
5 each IT event must be mapped to a business impact within the context of the business process. The present invention enables this mapping of IT severity to business impact severity.

The present invention provides an end-to-end Business
10 Systems Management (BSM) capability with the focus on integrating the specific IT infrastructure components supporting one, or many, key business processes into a single end-to-end management platform. One of the objects of the invention is to provide an Event Management system
15 which integrates the monitoring and alerting of disparate enabling technologies to achieve efficient and succinct problem determination and notification. The systems management platform is not only capable of monitoring and managing a server as a "tower" but also the interfaces
20 between the various technology towers that exist, because the business processes they support create the requirements for these systems to communicate.

With reference now to the figures, **Figure 1** depicts a pictorial representation of a network of data processing
25 systems in which the present invention may be implemented. Network data processing system **100** is a network of computers in which the present invention may be implemented. Network data processing system **100** contains a network **102**, which is the medium used to provide
30 communications links between various devices and computers connected together within network data processing system **100**. Network **102** may include connections, such as wire,

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wireless communication links, or fiber optic cables.

In the depicted example, a server 104 is connected to network 102 along with storage unit 106. In addition, clients 108, 110, and 112 also are connected to network 102. These clients 108, 110, and 112 may be, for example, personal computers or network computers. In the depicted example, server 104 provides data, such as boot files, operating system images, and applications to clients 108-112. Clients 108, 110, and 112 are clients to server 104. Network data processing system 100 may include additional servers, clients, and other devices not shown.

In the depicted example, network data processing system 100 is the Internet with network 102 representing a worldwide collection of networks and gateways that use the TCP/IP suite of protocols to communicate with one another. However, any protocol can be used. At the heart of the Internet is a backbone of high-speed data communication lines between major nodes or host computers, consisting of thousands of commercial, government, educational and other computer systems that route data and messages. Of course, network data processing system 100 also may be implemented as a number of different types of networks, such as for example, an intranet, a local area network (LAN), or a wide area network (WAN). Figure 1 is intended as an example, and not as an architectural limitation for the present invention.

Referring to Figure 2, a block diagram of a data processing system that may be implemented as a server, such as server 104 in Figure 1, is depicted in accordance with a preferred embodiment of the present invention. Data processing system 200 may be a symmetric multiprocessor (SMP) system including a plurality of

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processors 202 and 204 connected to system bus 206.
Alternatively, a single processor system may be employed.
Also connected to system bus 206 is memory controller/
cache 208, which provides an interface to local memory
5 209. I/O bus bridge 210 is connected to system bus 206
and provides an interface to I/O bus 212. Memory
controller/cache 208 and I/O bus bridge 210 may be
integrated as depicted.

Peripheral component interconnect (PCI) bus bridge
10 214 connected to I/O bus 212 provides an interface to PCI
local bus 216. A number of modems may be connected to PCI
bus 216. Typical PCI bus implementations will support
four PCI expansion slots or add-in connectors.
Communications links to network computers 108-112 in
15 Figure 1 may be provided through modem 218 and network
adapter 220 connected to PCI local bus 216 through add-in
boards.

Additional PCI bus bridges 222 and 224 provide
interfaces for additional PCI buses 226 and 228, from
20 which additional modems or network adapters may be
supported. In this manner, data processing system 200
allows connections to multiple network computers. A
memory-mapped graphics adapter 230 and hard disk 232 may
also be connected to I/O bus 212 as depicted, either
25 directly or indirectly.

Those of ordinary skill in the art will appreciate
that the hardware depicted in Figure 2 may vary. For
example, other peripheral devices, such as optical disk
drives and the like, also may be used in addition to or in
30 place of the hardware depicted. The depicted example is
not meant to imply architectural limitations with respect
to the present invention.

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The data processing system depicted in **Figure 2** may be, for example, an IBM RISC/System 6000 system, a product of International Business Machines Corporation in Armonk, New York, running the Advanced Interactive Executive (AIX) operating system.

With reference now to **Figure 3**, a block diagram illustrating a data processing system is depicted in which the present invention may be implemented. Data processing system 300 is an example of a client computer. Data processing system 300 employs a peripheral component interconnect (PCI) local bus architecture. Although the depicted example employs a PCI bus, other bus architectures such as Accelerated Graphics Port (AGP) and Industry Standard Architecture (ISA) may be used. Processor 302 and main memory 304 are connected to PCI local bus 306 through PCI bridge 308. PCI bridge 308 also may include an integrated memory controller and cache memory for processor 302. Additional connections to PCI local bus 306 may be made through direct component interconnection or through add-in boards. In the depicted example, local area network (LAN) adapter 310, SCSI host bus adapter 312, and expansion bus interface 314 are connected to PCI local bus 306 by direct component connection. In contrast, audio adapter 316, graphics adapter 318, and audio/video adapter 319 are connected to PCI local bus 306 by add-in boards inserted into expansion slots. Expansion bus interface 314 provides a connection for a keyboard and mouse adapter 320, modem 322, and additional memory 324. Small computer system interface (SCSI) host bus adapter 312 provides a connection for hard disk drive 326, tape drive 328, and CD-ROM drive 330. Typical PCI local bus implementations will support three

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or four PCI expansion slots or add-in connectors.

An operating system runs on processor 302 and is used to coordinate and provide control of various components within data processing system 300 in Figure 3. The

5 operating system may be a commercially available operating system, such as Windows 2000, which is available from Microsoft Corporation. An object oriented programming system such as Java may run in conjunction with the operating system and provide calls to the operating system
10 from Java programs or applications executing on data processing system 300. "Java" is a trademark of Sun Microsystems, Inc. Instructions for the operating system, the object-oriented operating system, and applications or programs are located on storage devices, such as hard disk
15 drive 326, and may be loaded into main memory 304 for execution by processor 302.

Those of ordinary skill in the art will appreciate that the hardware in Figure 3 may vary depending on the implementation. Other internal hardware or peripheral
20 devices, such as flash ROM (or equivalent nonvolatile memory) or optical disk drives and the like, may be used in addition to or in place of the hardware depicted in Figure 3. Also, the processes of the present invention may be applied to a multiprocessor data processing
25 system.

As another example, data processing system 300 may be a stand-alone system configured to be bootable without relying on some type of network communication interface, whether or not data processing system 300 comprises some
30 type of network communication interface. As a further example, data processing system 300 may be a Personal Digital Assistant (PDA) device, which is configured with

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ROM and/or flash ROM in order to provide non-volatile memory for storing operating system files and/or user-generated data.

5 The depicted example in **Figure 3** and above-described examples are not meant to imply architectural limitations. For example, data processing system 300 also may be a notebook computer or hand held computer in addition to taking the form of a PDA. Data processing system 300 also may be a kiosk or a Web appliance.

10 Referring now to **Figure 4**, a flowchart illustrating a method for developing an end-to-end Event Management application is depicted in accordance with the present invention. The first step is business decomposition (step 401). In this step, the exact steps necessary to
15 effect a successful business transaction, from the beginning of the process until its successful completion, are documented. Each one of these steps in the business process is associated with an application, and in business decomposition, it is important to harvest from
20 the subject matter experts the names of the applications which enable each of these particular steps. It is through these applications that the business process interacts with various IT technologies. An application functional and operational model is developed which
25 describes the interactions, interdependencies and interfaces of all the business process enabling applications. The functional and operational model is an important component to determining where monitors should be deployed to optimally manage the technology enabling a
30 particular business process. It is important to identify the metric used by the business to gauge the economic health of the business process in order to quantify the

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costs and benefits of implementing a solution.

After business decomposition, the next step is technical decomposition (**step 402**). This involves identifying and documenting all of the technology
5 elements and support organizations which are necessary to execute the enabling applications of a particular business process. As the technology is identified, it is important to have the subject matter experts explain the events, monitors, and management systems that are
10 currently in place. With the business process decomposed into its parts and traced to the relevant IT technology components, a Business System Management (BSM) configuration database can be built (**step 403**).

With the BSM database established, monitors for the
15 business process enabling technology can be designed and deployed (**step 404**). The monitors allow the design team to precisely document the particular IT functions occurring during a specific business process.

Through proper monitoring, it is then possible to
20 properly map IT severity to business impact severity (**step 405**). This mapping helps to present a clearer picture of how IT technical problems relate to business processes and is crucial to integrating the IT infrastructure into a single end-to-end application aimed
25 at optimizing business processes (from an IT perspective). For example, it is possible that an IT failure may have no discernible effect on a business process. By the same token, a given IT failure may affect one business process substantially, but not
30 another. Of absolute importance to this step is a metric to allow the quantification of business losses due to particular IT failures.

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Currently, IT components are compartmentalized into isolated towers, as explained above. When implementing a business process, these IT towers are only aware of their own particular performance, without any knowledge of how
5 that performance interacts with other IT towers and, ultimately, the business process. For example, the support team for a mainframe computer within the network may be able to show that the mainframe was up and operational 98% of a specified time period. However,
10 this, in and of itself, reveals nothing concerning impact on the business process supported by the mainframe.

As a further example, if each isolated tower is functioning within acceptable parameters and only one is operating near the margin of its performance tolerance,
15 there might be no effect upon the business process. However, if several of the towers are at the margin of their respective tolerances, the aggregate effect could disrupt the business process as a whole, even though each tower is working within its own "acceptable" range.
20 Properly mapping the IT severity to the business impact severity presents a much clearer picture of how disparate IT performance parameters interact and affect the overall business process.

It is now possible to develop correlation logic and
25 rules within a business context (**step 406**), which will enable the formulation of a business process view that integrates technical and business concerns into a unified conceptual structure (**step 407**). From here, an integrated end-to-end event management platform can be
30 developed for the business process (**step 408**). In essence, this event management platform is a "super" application custom fitted to a specific business process and is constructed using several smaller, disparate

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applications, and their associated IT elements.

It is very likely that the new end-to-end platform will need to integrate with an existing event management process, outside the scope of the contracted services.

5 In order to build an end-to-end event management process that is larger than the event management platform, it will be necessary to integrate the platform at both the process and technology level. Essentially, the event management platform will have a defined input/output
10 event management "socket" that helps effect integration into the overall event management architecture.

The development of an event management platform is not limited to business processes within a single business entity. An event management platform may also
15 be developed between several business entities, particularly those entities with continuing, long-term relationships. For example, a supplier and distributor would certainly benefit from developing a common event management platform, considering their interdependence
20 and the myriad of disruptions which naturally occur in such a relationship.

It is important to note that while the present invention has been described in the context of a fully functioning data processing system, those of ordinary
25 skill in the art will appreciate that the processes of the present invention are capable of being distributed in the form of a computer readable medium of instructions and a variety of forms and that the present invention applies equally regardless of the particular type of
30 signal bearing media actually used to carry out the distribution. Examples of computer readable media include recordable-type media, such as a floppy disk, a hard disk drive, a RAM, CD-ROMs, DVD-ROMs, and

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transmission-type media, such as digital and analog communications links, wired or wireless communications links using transmission forms, such as, for example, radio frequency and light wave transmissions. The
5 computer readable media may take the form of coded formats that are decoded for actual use in a particular data processing system.

The description of the present invention has been presented for purposes of illustration and description,
10 and is not intended to be exhaustive or limited to the invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art. The embodiment was chosen and described in order to best explain the principles of the invention,
15 the practical application, and to enable others of ordinary skill in the art to understand the invention for various embodiments with various modifications as are suited to the particular use contemplated.

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